

PATENT SPECIFICATION

(11) 1216238

1216238

DRAWINGS ATTACHED

- (21) Application No. 23617/68 (22) Filed 17 May 1968
(23) Complete Specification filed 30 April 1969
(45) Complete Specification published 16 Dec. 1970
(51) International Classification B 24 b 23/04
(52) Index at acceptance B3D 1B1 2A15 2A21



(54) IMPROVEMENTS IN OR RELATING TO POWER-DRIVEN ABRASIVE TOOLS

(71) We, BLACK & DECKER LIMITED, a British Company, of Harmondsworth, Middlesex, and JOHN JOSEPH DONNELLY, a British Subject, of 35, Hepplewhite Close, High Wycombe, Buckinghamshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to power-driven abrasive tools.

Existing tools of this kind include a housing for receiving the drive-shaft of the power-unit and a backing plate, which is operatively connected to the drive-shaft, for carrying the abrasive material. The backing plate is usually secured to the housing by a number of retaining pillars each of which consist of a central body-portion of elastomeric material into each end of which is arranged an internally-threaded metal insert. Because these inserts are secured to the backing plate and to the housing by means of screws, there is a risk of the parts becoming loosened during operation but this was avoided to some extent by the provision of lockwashers. However, moulding the central body-portion of the pillars around the threaded inserts is a time-consuming and costly operation due to the need to load the inserts within the mould. Furthermore, the fact that screws and lockwashers are required increases assembly costs.

According to the present invention a power-driven abrasive tool for use with a rotary power unit includes a housing for receiving the drive-shaft of the power unit and a backing-plate which is arranged, in use, for operative connection to the drive-shaft, the backing plate and the housing being mounted on opposite ends of a number of retaining pillars, made entirely of elastomeric material, one end of each pillar being so shaped that the backing plate may be detachably fastened thereto.

Throughout the specification and claims the term 'elastomeric material' should be construed to cover any material having a degree of flexibility and resilience consistent with the [Price 5s. 0d. (25p)]

production of a retaining pillar which can withstand the forces exerted when used in a power driven abrasive tool.

The said one end may be shaped for push-fitting engagement with the backing plate, and may be arranged to engage in a corresponding recess formed in the backing plate. A portion of the said one end may be shaped to prevent relative rotation between the pillar and the backing plate. In this case, the portion may be of generally rectangular cross-section and may be arranged to engage into a complementary recess formed in the backing plate.

Alternatively, the said one end of the pillar may be clamped to the backing plate by means of a strap member which is itself detachably securable to the backing plate. The said one end may be formed with a disc-like flange which is sandwiched between the strap member and the backing plate. In this case, the strap member may be formed with a pillar receiving orifice the diameter of which is less than the diameter of said flange. Conveniently, two strap members can be provided each being arranged to clamp a pair of said retaining pillars. Furthermore, the backing plate may be formed with projections which serve to locate each pillar on the backing plate and to prevent relative rotation therebetween.

The other end of each pillar may be shaped for push-fitting engagement with the housing, and may be arranged to engage in a corresponding recess formed in the housing. A portion of the said other end may be shaped to prevent relative rotation between the pillar and the housing. In this case, the said portion may be of generally rectangular cross-section and may be arranged to engage into a complementary recess formed in the housing.

Alternatively, the other end of each pillar may be clamped to the housing by means of a clamping plate which is itself detachably securable to the housing. The said other end may be formed with a frusto-conical portion which is insertable into an orifice formed in said clamping plate, the maximum diameter of said frusto-conical portion being greater than

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the diameter of said orifice. Conveniently, two clamping plates may be provided each being arranged to clamp a pair of said retaining pillars. Preferably, the backing plate may be generally rectangular, a retaining pillar being mounted in each corner thereof.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, of which:—

Figure 1 is a part cut-away, part sectional side elevation of an orbital sander attachment secured to an electric power drill;

Figure 2 is a plan view of the backing plate of the attachment in Figure 1;

Figure 3 is an enlarged side elevation of the retaining pillars shown in Figure 1;

Figure 4 is a plan view of the pillars shown in Figure 3;

Figure 5 is a plan view of an alternative backing plate construction and clamping arrangement; and

Figure 6 is a section taken on the line A—A of Figure 5.

The orbital sander shown in the drawings consists of essentially a housing 1 on which is mounted a rectangular backing plate 2 provided at its ends with a pair of rotatable clamping rods 3 and 4. The latter clamp the ends of a sheet of paper-backed abrasive paper 5, and the paper is thereby held taut against a rectangular pad 6, which is secured to the underside of the plate 2 by adhesive. The pad 6 may be made of felt, 'sponge' rubber of any synthetic material exhibiting a degree of resilience.

The housing 1 of the sander attachment is formed with a pair of lugs 7 which engage in slots 8 formed in the casing 9 of a rotary power unit in the form of an electric drill indicated generally at 10. The slots 8 may also serve as ventilation apertures for the motor of the drill, not shown. In order to prevent vibration between the attachment and the drill, the housing 1 is provided with a sliding block 11 formed with engaging tabs 12 which locate in slots 13 in the casing 9 of the drill, the slots 13 being similar in form to the slots 8. Movement of the block 11 is provided by means of a manually adjustable knob 14 which passes through the upper part of the housing and has a threaded shank 15 which engages with a nut-like part 16 on the sliding block 11.

Screwed into the drive spindle 17 of the drill 10 is the threaded shank portion 18 of an eccentric counter-balance indicated generally at 19. The latter is also provided with a counter-weight 20 and an eccentric shaft 21 which is rotatable within a plain bearing 22 secured to the backing plate 2. An eccentric counter-balance of this type is described in more detail in our co-pending application No. 23618/68 (Serial No. 1216239). Due to the fact that the shank 18 and the shaft 21 are laterally offset one to the other, in operation,

the backing plate 2 will execute eccentric orbital movement about the longitudinal axis of the shank 18. Consequently each grain of the abrasive paper 5 will traverse a small orbit so as to present every sharp cutting edge to the work.

The backing plate 2 is secured to the housing 1 by means of four retaining pillars moulded entirely from elastomeric material such as rubber. Each pillar comprises a central body 23 of generally square cross-section, an upper or housing engaging end indicated generally at 24, and a lower or backing plate engaging end indicated generally at 25, see Figure 3. Assembly of each of the pillars is carried out by first inserting the end 24 through one of four square-shaped holes 26 formed in circular raised portions 27 of the backing plate 2. The pillar is then pushed upwards until the edges of the hole 26 surround a portion 28 of the lower end 25 of the pillar and are themselves sandwiched between a circular disc-like terminal portion 29 and a flared portion 30 of the body 23. To prevent relative rotation movement between the pillars and the backing plate the portion 28 is made of substantially square-shaped cross-section. The backing plate with the four pillars is then hand assembled into the housing 1. This is facilitated by forming the terminal part 31 of the upper end of each pillar as the frustum of a cone, which terminal part is forced upwards past an annular rib 32 provided within a generally cylindrical locating member 33 formed in the housing 1. In performing this operation the rib 32 effectively surrounds a cylindrical portion 34 on the pillar and is itself sandwiched between the underside of the terminal part 31 and the upper surface of a tapered portion 35 of the pillar. The tapered portion 35 has four identical faces which are trapezoidal in form and is of generally square-shaped cross-section, the four faces engaging with complementary portions 36 in the locating member 33 to prevent relative rotational movement between the pillars and the housing 1. It is not essential that the pillars are formed with portions of generally rectangular cross-section as long as relative rotation between the pillars and the backing plate or housing respectively is prevented.

For example, pillars such as that shown in Figures 5 and 6 may be used in combination with further means described below. It will be seen that the pillars shown in Figures 5 and 6 are formed with a frusto-conical upper end portion 37, a cylindrical body-portion 38 and a circular disc-like lower end portion 39. In this case, relative rotation is prevented by clamping the lower end portion of each pillar to a modified backing plate 40. Conveniently, a pair of strap-members 41 may be used (one of which is shown in Figures 5 and 6), which not only serve to clamp the pillars to the backing plate but also hold clamping rods 42

in position, there rods being similar in function to the rods 3 and 4 shown in Figure 1. As shown each strap member 41 is formed with a pair of circular holes 43 the diameter of which are intermediate that of the end portion 39 and the body portion 38 of each pillar. Consequently, the pillars may be inserted into the strap-members so that the end portion 39 abuts the underside thereof (see Figure 6). After insertion of the pillars each strap member is secured to the backing plate 40 by means of nut 44 and bolt 45. To ensure correct location of each strap-member on the backing plate each end of the latter is provided with a pair of upturned lugs 46 which enter corresponding slots 47 formed in the strap-members. The backing plate is also formed with four raised portions 48 each of which is arranged, in co-operation with a respective lug 46, to hold in position the lower end portion of a corresponding pillar. Clamping of each pillar is thereby achieved by the combined effect of the lugs 46 and raised portions 48 and sandwiching the lower end of each pillar between the strap-members and the backing plate. The upper end portion 37 of each pillar may be secured to the sander attachment housing in somewhat similar fashion to that described for the example illustrated in Figure 1 to 4. Alternatively, the upper end portions may be arranged to be plugged into holes formed in a pair of clamping plates (not shown) each of which is detachably secured to the underside of the housing vertically above a corresponding one of the strap members 41.

It will be understood that the orbital sander arrangement described above could be of unitary construction, that is, in which the electric drill 10 and the housing 1 are formed integrally. Furthermore the electric drill 10 could be replaced not only by a drill which is operated, e.g. pneumatically, but also by any power unit which is capable of providing rotation of the drive spindle 17.

In particular, it will be understood that the pillars described above are not limited in application to orbital sander attachments or arrangements but can be used in conjunction with any power driven abrasive tool in which there is relative movement between the backing plate and the housing.

WHAT WE CLAIM IS:—

1. A power-driven adrasive tool for use with a rotary power unit including a housing for receiving the drive-shaft of the power unit and a backing plate which is arranged, in use, for operative connection to the drive-shaft, the backing plate and the housing being mounted on opposite ends of a number of retaining pillars, made entirely of elastomeric material, one end of each pillar being so shaped that the backing plate may be detachably fastened thereto.

2. A tool as claimed in claim 1 in which

the said one end of each pillar is shaped for push-fitting engagement with the backing plate.

3. A tool as claimed in claim 1 or 2 in which the said one end of each pillar is arranged to engage in a corresponding recess formed in the backing plate.

4. A tool as claimed in any one of claims 1 to 3 in which a portion of the said one end of each pillar is shaped to prevent relative rotation between the pillar and the backing plate.

5. A tool as claimed in claim 4 in which the said portion is of generally rectangular cross-section and is arranged to engage into a complementary recess formed in the backing plate.

6. A tool as claimed in claim 1 in which the said one end of the pillar is clamped to the backing plate by means of a strap member which is itself detachably securable to the backing plate.

7. A tool as claimed in claim 6 in which the said one end of the pillar is formed with a disc-like flange which is sandwiched between the strap-member and the backing plate.

8. A tool as claimed in claim 7 in which the strap-member is formed with a pillar receiving orifice the diameter of which is less than the diameter of said flange.

9. A tool as claimed in any one of claims 6 to 8 in which two strap-members are provided each being arranged to clamp a pair of said retaining pillars.

10. A tool as claimed in any one of claims 6 to 9 in which the backing plate is formed with projections which serve to locate each pillar on the backing plate and to prevent relative rotation therebetween.

11. A tool as claimed in any one of claims 1 to 10 in which the other end of each pillar is shaped for push-fitting engagement with the housing.

12. A tool as claimed in claim 11 in which the said other end is arranged to engage in a corresponding recess formed in the housing.

13. A tool as claimed in claim 11 or 12 in which a portion of the said other end is shaped to prevent relative rotation between the pillar and the housing.

14. A tool as claimed in claim 13 in which the said portion is of generally rectangular cross-section and is arranged to engage into a complementary recess formed in the housing.

15. A tool as claimed in any one of claims 1 to 10 in which the other end of each pillar is clamped to the housing by means of a clamping plate which is itself detachably securable to the housing.

16. A tool as claimed in claim 15 in which the said other end is formed with a frusto-conical portion which is insertable into an orifice formed in said clamping plate, the maximum diameter of said frusto-conical portion being greater than the diameter of said orifice.

17. A tool as claimed in claim 16 in which two clamping plates are provided each being arranged to clamp a pair of said retaining pillars.
- 5 18. A tool as claimed in any one of claims 1 to 17 in which the backing plate is generally rectangular, a retaining pillar being mounted in each corner thereof.
19. A power driven abrasive tool substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings. 10

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1970.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.

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3 SHEETS

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Sheet 1

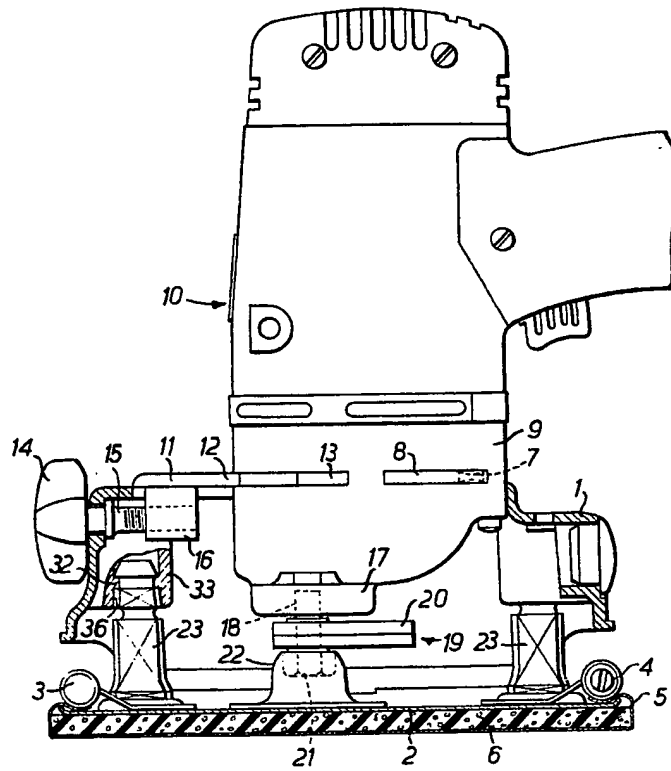


FIG. 1

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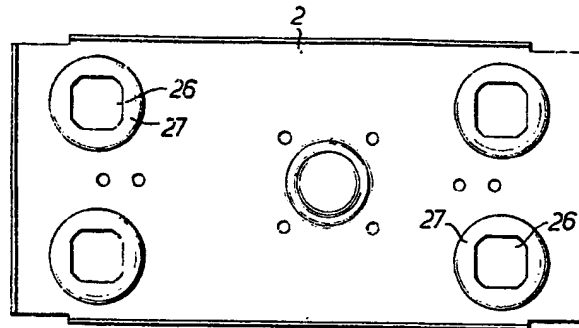


FIG. 2.

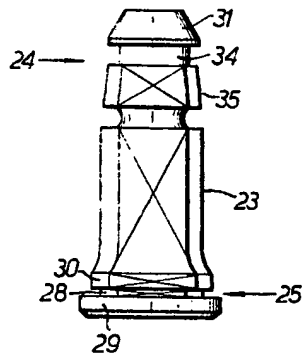


FIG. 3.

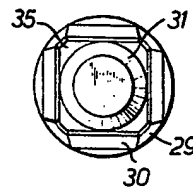


FIG. 4.

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Sheet 3

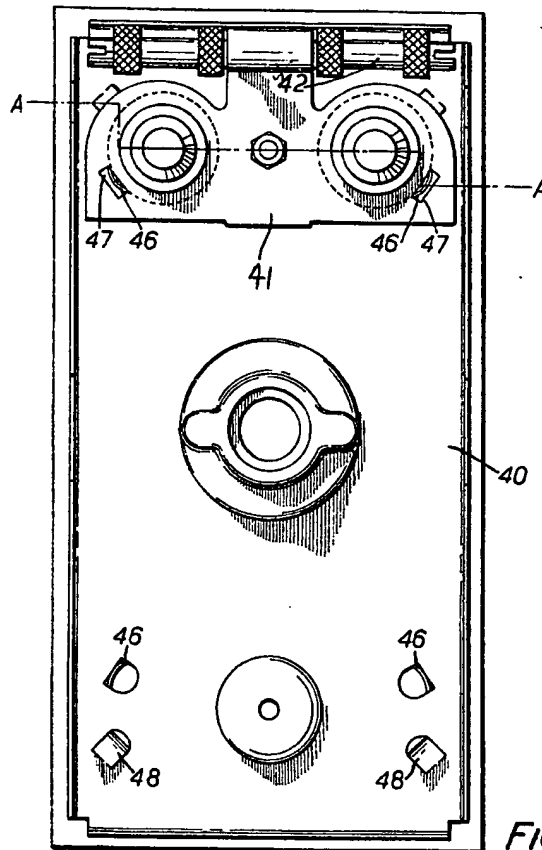


FIG. 5.

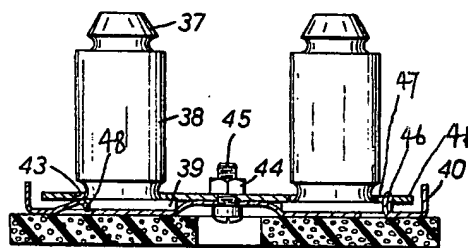


FIG. 6.

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